

## OBSERVATIONS ON SOME EUROPEAN ANTS.\*

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A sojourn of a few months during the past summer (1909) in Switzerland and Italy has enabled me to continue my observations begun in the former country during the summer of 1907.† For the past forty years the ant-fauna of these countries has been so diligently studied by Professors Forel and Emery, that one can expect to find little that is new except in localities which their very busy lives have prevented them from exploring. The following notes, therefore, owe their interest to the fact that I was able to visit two of the tributary valleys of the Rhone, which, I believe, have never been explored by myrmecologists. Through the courtesy of Prof. Ed. Bugnion, of Lausanne, I was asked to accompany the annual field excursion of the "Murithienne," a flourishing Valaisian natural history society, to the Turtmann Glacier (July 19-21), at the head of the stream of the same name, and later I spent a week (Aug. 10-18) collecting at Zermatt, in the adjacent valley of the Matter-Visp. Three of the following notes relate to some parasitic ants found in these localities; the fourth relates to a diminutive, non-parasitic form that occurs on the island of Lido, near Venice.

I. *Formica rufa* L.

A few years ago‡ I predicted that this conspicuous European ant, which builds great mounds in the forests throughout the northern and central portions of the continent and above an elevation of about 1,000 m. in the Alps, would eventually be found to be a temporary parasite, during the earliest stages of its colonial life, on the common *F. fusca*. I was led to make this prediction, first, because I had found some of our North American allies of *F. rufa* (*F. consocians*,

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† Comparative Ethology of the European and North American Ants, *Journ. Psych. u. Neurol.*, XIII, 1908, pp. 404-435, pls. III and IV, 6 text figs.

‡ A New Type of Social Parasitism among Ants, *Bull. Amer. Mus. Nat. Hist.*, XX, Oct. 11, 1904, pp. 347-375.

*microgyna*, *dakotensis*, *exsectoides*, etc.) to be temporary parasites on *F. incerta* and *subsericca*; second, because Forel and Wasmann had recorded the occurrence of a few small, mixed colonies of *fusca* with allies of *rufa* (*F. pratensis*, *truncicola*, *exsecta* and *pressilabris*); and third, because, notwithstanding the abundance of *F. rufa* in many parts of Europe, no one had ever seen one of its females in the act of establishing a colony independently.

After finding *F. truncicola* to be, as I had predicted, a temporary parasite on *fusca*, Wasmann undertook a number of experiments with a view to determining the behavior of *rufa* towards this species.\* He introduced recently fecundated queens of *rufa* into artificial nests containing *fusca* workers and pupæ, with results that led him to infer that the adoption of the *rufa* queen by the *fusca* workers is accomplished with greater difficulty than that of the *truncicola* queen, and that the *rufa* queen often behaves like the *sanguinea* queen under the same circumstances, *i. e.*, kills a number of the *fusca* and collects and guards their pupæ till the callow workers hatch and adopt her.

While I was in Switzerland I did not have the facilities for performing experiments like those of Wasmann, but I was able to make the three following observations, which show that, under natural conditions, *F. rufa* is, in all probability, a typical temporary parasite like *consocians* and *truncicola*, and does not establish her colonies after the manner first observed by myself in the American forms of *sanguinea*† and subsequently confirmed for the European type of this species by Viehmeyer‡ and Wasmann.§

1. July 20 I found just below the lateral moraine of the Turtmann Glacier, at an altitude of about 2,000 m., a large nest of *F. fusca* under a small pile of flat stones. This nest contained several hundred *fusca* workers, several pupæ and larvæ, but no queen of this species. In the midst of the colony, however, there was a fine *rufa* queen, at once recognized by her size, red thorax and glabrous gaster. She had

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\* Weitere Beiträge zum sozialen Parasitismus und der Sklaverei bei den Ameisen, *Biol. Centralbl.*, XXVIII, 1908.

† On the Founding of Colonies by Queen-ants, with Special Reference to the Parasitic and Slave-making Species, *Bull. Amer. Mus. Nat. Hist.*, XXII, 1906, pp. 33-105.

‡ Zur Koloniegründung der parasitischen Ameisen, *Biol. Centralbl.*, 1908, pp. 18-32.

§ Weitere Beiträge, etc., *loco citato*.

undoubtedly been adopted by the black workers and was in good standing in the community, as was shown when she was confined in a large bottle with a lot of the workers.

2. Later on the same day I found somewhat further down the Turtmann valley (alt. about 1,900 m.), between the foot of the glacier and the hamlet Gruben, a second much smaller colony, comprising only 50-80 *fusca* workers, several sexual larvæ of this species and a single *rufa* queen, which was also living on the best of terms with the workers. There was no *fusca* queen. Lying close together in the very center of the nest in one of the superficial chambers were four dead but perfectly fresh *rufa* queens, each with her body cut in two at the petiole. Apparently, therefore, five *rufa* queens had successively sought adoption in this nest, but four had been killed by the *fusca* workers (or by the *rufa* queen?) and only one had been able to prove her right to adoption.

3. August 11 I found under a small flat stone a few hundred yards from the foot of the Boden Glacier near Zermatt, at an altitude of about 2,000 m., a little colony comprising only about a dozen *fusca* workers, two dozen very small *rufa* workers, a *rufa* queen and about 50 larvæ and pupæ of the latter species. This colony resembled in every respect the small mixed colonies of *F. consocians* and *incerta* which I have repeatedly found at Colebrook, Conn. It was undoubtedly a colony in its second year, still containing the last survivors of the original *fusca* colony, which were destined to die off in the course of a few months or years and leave behind a pure colony of *rufa*. The two mixed colonies found in the Turtmann valley had evidently just been formed. In all three cases the absence of the *fusca* queens was very striking, since in the various localities which I visited in the Turtmann and Visp valleys nearly every colony of *fusca*—and I examined hundreds of them at different elevations, even up to nearly 3,000 m. on the Gorner Grat—contained from two to six dealated queens. These were always enjoying the warmth of the superficial galleries, where they were at once noticed as soon as the stones covering the nests were removed.

These three colonies, therefore, point to a method of colony formation by *rufa* quite like that of *F. consocians* and *truncicola*, and lend no support to Wasmann's view that the *rufa* queen, under natural conditions, behaves like *sanguinea*. The first observation shows, moreover, that the *rufa* queen may be adopted by a large

and vigorous *fusca* colony. The presence of sexual larvæ in the second colony shows that the adoption of the alien queen must have taken place a short time before I found the nest, and the presence of four dead *rufa* queens in this nest indicates either that the intrusion of this species must be very vigorously resisted by the *fusca*, or that the *rufa* queen after once gaining adoption violently resents the intrusion of any other queens of her own species. July 19, during my walk up through the Turtmann valley, I saw numbers of deälated *rufa* queens running over the ground, so that the marriage flight of this species must have occurred either on that or the immediately preceding days. It is not improbable, therefore, that the *rufa* queens which I found in nests (1) and (2) had left their parental colonies only a few days before I found them associated with the *fusca* workers.

If my interpretation of the behavior of the *rufa* queen is correct, we must completely abandon Wasmann's hypothesis that dulosis is derived from temporary parasitism, since *rufa* no longer appears as a primitive and generalized type which could have given rise to both the passive temporary parasitism seen in *F. consocians*, *truncicola*, etc., and the aggressive, predatory parasitism of *sanguinea*, but belongs unequivocally to the *consocians* type. I am inclined to believe that Wasmann has been unconsciously led to his view through giving undue weight to the purely taxonomic status of *F. rufa* in our classification of the various species of *Formica*. As an old Linnean species it has come to be regarded as the type of a group of forms (*truncicola*, *pratensis* and a long series of American subspecies and varieties), but this is, of course, a purely artificial assumption, and we are not to conceive the European *rufa* as the most primitive ant of its group. Indeed this ant is more probably to be regarded as one of the most highly specialized and recent forms in the genus. I have elsewhere\* given my reasons for dissenting from Wasmann's opinion that the predatory instincts of *sanguinea* have arisen from the passive form of adoption seen in *consocians* and *truncicola*. Very recently Emery† has advanced arguments very similar to my own. Emery

\* The Ants of Casco Bay, Maine, with Observations on two Races of *Formica sanguinea* Latreille, *Bull. Amer. Mus. Nat. Hist.*, XXXIV, 1908, p. 633 et seq.

† Intorno all' origine delle Formiche dulotiche, parasitiche a mirmecofile, *Rendic. Sess. R. Accad. Sci. Ist. Bologna*, 17 Gen., 1909, pp. 36-51; translation: Ueber den Ursprung der dulotischen, parasitischen und myrmekophilen Ameisen, *Biol. Centralbl.*, XXIX, 1909, pp. 352-362.

seems, however, in his discussion of *F. rufa* to have been influenced by the results of Wasmann's experiments on females of this ant placed in artificial *fusca* nests, for he does not see the basis of the whole matter of temporary, permanent and dulotic parasitism in the general tendency of ant-queens to court adoption by workers of their own species of the same or other colonies—a tendency which Wasmann and I have attributed to the very general or widespread formicine habit of retaining a number of queens in the same colony—but regards the founding of *rufa* colonies with *fusca* workers as the primitive method, the founding of new nests by fission of the maternal colony and adoption of queens of the same species as a secondary development. Possibly the *rufa* queen, like the queen of *sanguinea* and of other species of *Formica* may be, as I have suggested,\* an opportunist to the extent of regulating her behavior according to the behavior of the particular *fusca* colony which she enters. If the *fusca* are aggressive she may act more like *sanguinea*, whereas if they are timid or indifferent she probably permits herself to be passively adopted.†

## II. *Strongylognathus huberi* Forel.

This interesting parasite on the common European *Tetramorium cespitum*, was originally described by Forel from workers (Fig. 1, *A*) taken from a colony which he found on a warm, rocky slope near Fully in the valley of the Rhone.‡ In 1900 he found the males and females (Fig. 1, *B*) in another nest in the same locality§ and gave an interesting account of the behavior of the workers. August 8, 1902, Prof. Carl Escherich also succeeded in finding a large colony containing many males and females in the same locality. Although I visited the place June 16, 1907, and again July 23, 1909, in company with Prof. Forel and Messrs. H. Viehmeyer and F. Schimmer, and sought very diligently for other colonies, I was unsuccessful. I was therefore

\* The Ants of Casco Bay, etc., *loco citato*.

† A recent reply by Wasmann (Ueber den Ursprung des sozialen Parasitismus, der Sklaverei und der Myrmekophilie bei den Ameisen. *Biol. Centralbl.*, XXIX, Oct. and Nov., 1909) to Emery's criticisms, was received too late for consideration in connection with this note on *F. rufa*.

‡ Les Fourmis de la Suisse, 1874, p. 71.

§ *Strongylognathus huberi* et voisins, *Bull. Soc. Ent. Suisse*, X, 7, pp. 273-380.

greatly pleased some weeks later to find the species at Zermatt in seven *Tetramorium* colonies. The appearance of the specimens in this locality, however, struck me as being peculiar, because they seemed to differ from a series of topotypes of all three phases of *huberi* which had been generously given me by Professors Forel and Escherich. The workers of the Zermatt specimens were much darker in color except for the pro- and mesonotum which were very pale and shining and enabled me to distinguish them at a glance as they moved about among the *Tetramorium* workers. The males and females were in the larval and pupal condition in nearly all the nests

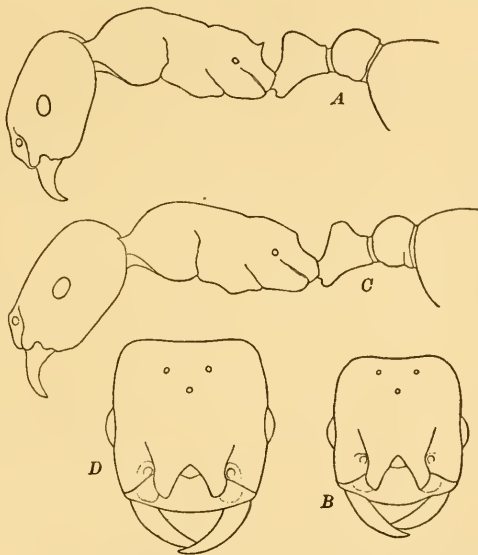


FIG. 1. A, *Strongylognathus huberi* Forel, worker; B, head of female; C, *S. huberi alpinus* subsp. nov., worker; D, head of female. All the figures drawn under the same magnification.

whereas the males and females of the uninfested *Tetramorium* colonies were either fully matured or had already celebrated their nuptial flight.

Careful comparison of the Zermatt specimens with the topotypes shows that they differ sufficiently from the typical form to be regarded as a new subspecies of the same rank as the other subspecies of *huberi*, namely, *christophi* Emery of Sarepta on the Volga, *caciliæ*

Forel of Spain, *afér* Emery of Spain and Algeria and *rehbinderi* Forel of the Caucasus. The new subspecies may be regarded as an alpine form of *huberi*, since it occurs at a considerably greater elevation (over 1,500 m.) than the type. I subjoin a brief description with some notes on the colonies which I found:

**Strongylognathus huberi alpinus, new subspecies.**

*Worker*.—Length 2.5–3.5 mm. (Fig. 1, C).

Differing from the worker of *huberi* as follows: Head somewhat broader and more robust. Epinotum unarmed, the small, pointed teeth of *huberi* being replaced by rather blunt angles. Summit of petiolar node in profile distinctly rounder and blunter and less compressed anteroposteriorly. Postpetiole twice as broad as long (decidedly longer in proportion to its width in *huberi*). Whole upper surface of pro- and mesonotum smooth and shining (shining area in *huberi* more restricted). Coloration in general much darker; head with a larger oblong, black or dark brown spot, as broad as the distance between the frontal carinæ, reaching from the clypeus nearly to the occipital border and rather sharply marked off on the sides from the paler, brownish yellow color of the cheeks. In the typical *huberi* the front and vertex are only slightly darker than the remainder of the head or, at any rate the dark area is not distinctly marked off on the sides and behind.

Epinotum of *alpinus* darker than the pro- and mesonotum, the petiole and postpetiole still darker. Infuscation of the gaster also decidedly deeper than in *huberi*, all the segments being dark brown or blackish, with yellowish bases. Legs brownish yellow, with dark brown articulations.

*Female*.—Length 4–4.6 mm. (Fig. 1, D).

Differing from the female of *huberi* in the following particulars: Head decidedly larger and broader, rectangular, not narrowed behind, less than one and a fourth times as long as broad. Epinotum with blunt angular projections in the place of the stout teeth of *huberi*. Upper border of petiole sharp but not compressed at the very summit. Postpetiole trapezoidal, distinctly broader in front than behind, with broadly rounded anterior corners and straight sides. Sculpture, pilosity and color as in the typical *huberi*.

*Male*.—Length 4.5–5 mm.

Differs from the male of *huberi* only in having decidedly blunter epinotal angles.

Described from numerous workers and females and two males taken from the nests described in the following notes:

1. August 13. The first colony of *alpinus* was found less than a kilometer below Zermatt at an altitude of about 1,620 m., on the warm western slope of the Matter valley, where there was no end of *Tetramorium* colonies under flat stones. The nest containing the *alpinus* was of small size and under a single stone. The *alpinus*

workers were fairly numerous—1:4 or 5 *Tetramorium*—and there were many male and female larvæ and pupæ. I was unable to find a fertile queen of either species.

2. August 13. In the same locality I found a second colony of large size and extending under several contiguous stones. There was about 1 *alpinus* to every 3-5 *Tetramorium*, with many male and female larvæ and pupæ of the former. No fertile queens could be detected.

3. August 14. In the same locality a small *Tetramorium* colony was found containing a number of *alpinus* pupæ of all three phases, but no imaginal workers. The absence of these made it seem probable that the pupæ had been recently robbed by the *Tetramorium* workers from some feeble mixed colony in the neighborhood. I failed to find a mother queen of either species.

4. August 18. On the right bank of the Triftbach, about fifteen minutes' walk from Zermatt and also on the warm western slope of the valley, I found under a small stone about sixty *alpinus* workers with two *Tetramorium* workers and no larvæ or pupæ of either species. The whole assemblage had the appearance of being a small foraging party which had taken temporary refuge under the stone. In the immediate neighborhood, however, I failed to find any larger colony of which it could have been a part.

5. August 18. In the same locality I found a small colony containing about as many *alpinus* as *Tetramorium* workers, with a small number of sexual larvæ and pupæ of the former. This colony was under an isolated stone about 30 cm. in diameter. No queens of either species were seen.

6. August 18. In the same place I came upon an enormous *Tetramorium* colony—the largest I have ever seen—under two huge, contiguous, flat stones, each about 1.6 m. in diameter, and several smaller stones near by. The workers of the two species were about equally abundant, and besides many pupæ of all phases of *alpinus*, there were many recently hatched females and a very few males of this species. I was unable to explore the nest as the large stones could not be moved. I collected in a bag a colony of *Tetramorium* with their brood from a point several hundred meters further up the slope and dumped it on the flat stone near one of the main entrances of the *alpinus* nest. These ants were slow in learning of the proximity of the aliens, but after waiting about fifteen minutes I saw the *alpinus* issue from their nest, move out over the earth I had dumped on the



stone and fiercely attack the strange *Tetramorium*. The workers of the parasitic species seized the *Tetramorium* by the head or thorax, curled their bodies around the latter and tried to pierce their armor with the sharp, sickle-shaped mandibles. Other *alpinus* workers made for the strange larvæ and pupæ and began to carry them into the nest. This they did rather clumsily, but they showed themselves to be very familiar with the position of the nest-entrances. The strange *Tetramorium* that were not engaged in mortal combat with the *alpinus* hurried away over the stone in the opposite direction with such larvæ and pupæ as they could rescue. The hosts of the *alpinus* were not seen to throw out the strange pupæ and larvæ brought into the nest by their parasites, as happened in the similar experiment performed by Forel on a colony of the typical *huberi*.

7. August 18. In the same locality I found under a small flat stone a colony very similar to (4). It comprised about 100 *alpinus* workers, a very few *Tetramorium* and two or three larvæ, presumably of the latter species. These ants, too, appeared to be merely a foraging troop hiding under a stone.

Several of these observations tend to confirm Forel's belief that *S. huberi* is still, unlike the more degenerate *S. testaceus*, able to make dulotic raids on strange *Tetramorium* colonies. This is indicated by the behavior of the huge colony (6) and by its size, which so far exceeded that of any of the *Tetramorium* colonies I have seen, that I can only suppose that it had grown by repeated slave-making forays. The two isolated bands of *alpinus* workers (4) and (7) also point in the same direction, and suggest that the forays of this ant may be nocturnal and that the dulotic troops may hide under stones during the hot hours of the day. This may, perhaps, account for the fact that the forays of this rare and diminutive ant have hitherto failed to attract attention.

### III. *Anergates atratulus* Schenck.

On finding such numbers of *Tetramorium* colonies on the western slopes of the Matter valley, and especially after coming upon the colonies containing the *Strongylognathus* described in the preceding paragraphs, I naturally began to look for the extraordinary *Anergates*, which is also a parasite on *Tetramorium*. After much search I succeeded in finding it in the locality south of Zermatt where I first observed *S. alpinus*, in two nests which may be briefly described:

1. August 13. A large *Tetramorium* colony under half a dozen rather large, flat, contiguous stones arrested my attention, because it contained several hundred larvæ, all of the same size and of a peculiar gray color, unlike the gleaming white larvæ so abundant in the other colonies of this ant. On scrutinizing the superficial chambers of the nest more closely, I saw four fine, deâlated *Anergates* queens in the peculiar, obese or physogastric condition, which this alone of all European ants is able to attain. Three of these queens were close together under the center of one of the stones, the other was in a similar position under an adjacent stone. It was quite clear then that the gray larvæ were the offspring of these queens, and from their size it was evident that they were mature and nearly or quite ready to pupate. Of course, there were besides only *Tetramorium* workers in the colony and none of their larvæ. I do not know whether other observers have noticed the singular uniformity in the age and development of the larvæ of *Anergates*. It is very striking, though it is what we should expect, for the life of the *Anergates* colony must be of short duration, since it cannot exceed that of its sterile host, the *Tetramorium* workers. It is, indeed, quite possible that the whole development of the *Anergates* colony does not require more than a year, or, at any rate, that the queens of this species become physogastric, owing to the rapid and enormous development of their ovaries, and begin to lay within a few months after entering the *Tetramorium* colony, and that the brood matures by the following summer. Owing to the altitude at which this colony was found (about 1,600 m.), the maturity of the brood must have been greatly delayed and probably would not have hatched till the latter part of August or early in September. In my former paper\* I described a fine *Anergates* colony which I found near Vaud, June 6, 1907, at a much lower elevation. This already contained the imaginal brood of the summer.

2. August 14. In the same locality but lower down the slope and less than a hundred meters from the Matter, I detected a second colony, which, however, was small and depauperate and was living under a single small stone. This colony, too, contained a number of the gray larvæ, which, as in the preceding case, were all of the same size and partly adhering by means of their hooked, dorsal hairs to the lower surface of the stone. The nest also contained a number of

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\* Comparative Ethology, etc., *loco citato*, p. 430.

large root-aphids of both sexes and in all their developmental stages. After careful search I found the obese *Anergates* queen, but she was dead and somewhat shriveled, and her thorax had been separated from her gaster. She had probably been killed by the *Tetramorium* workers, which were dividing their attention between bringing up her larvæ and attending the aphids.

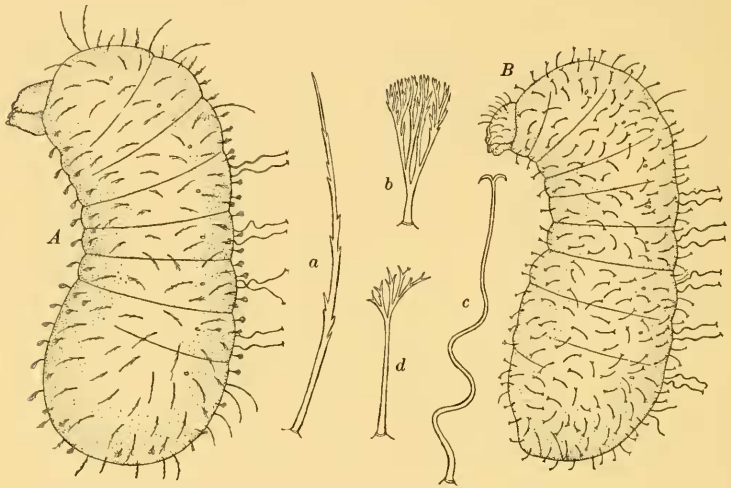


FIG. 2. A, adult larva of *Anergates atratulus*; a and b, long, serrate and short, branching hair of same, more highly magnified; B, adult worker larva of *Tetramorium cespitum*; c and d, long, anchor-tipped, dorsal hair and short, branching hair of same, more highly magnified.

As collectors are always interested in the various parasitic ants that live with *Tetramorium*, I may here introduce a few suggestions that may aid them in detecting infested colonies. In the first place, it is advisable to concentrate one's attention on a locality in which *Tetramorium* colonies are unusually abundant. In the second place, the collector should examine the nests at the height of the breeding season, that is, during June and July at the lower, and early in August at the higher altitudes, when the normal colonies contain larvæ and pupæ of all three phases. He may safely pass over at once all colonies containing the larger male and female larvæ and pupæ of the *Tetramorium*, as such colonies do not contain *Anergates* or any of the species or subspecies of *Strongylognathus* (*testacens*, *huberi*).

*alpinus*), and concentrate his attention on the colonies which at first glance appear to contain only workers and worker brood of the *Tetramorium*. If present, *S. huberi* and *alpinus* may be at once recognized by the number, size and color of their workers. *S. testaceus*, the commonest species of the genus, must be sought more carefully, because its workers are small and much less abundant, though they, too, are lighter in color than the *Tetramorium* workers. Later in the summer, (during July and August), of course, *Tetramorium* colonies infested with the various *Strongylognathus* are easily recognized by the great numbers of small males and females of these parasites. Finally, the presence of uniformly developed, gray larvæ may be taken to indicate the occurrence of *Anergates*, the rarest of these parasites, if its presence is not already conspicuously indicated by the numerous imaginal brood of small black females and sordid yellow, nymphoid males.

With a good pocket lens the *Anergates* larva may also be recognized by its peculiar hairs. It has been briefly described, and a few of its hairs have been figured by Adlerz.\* I give a figure (Fig. 2, *A*) of a larva from one of the nests described above, and also of a mature worker larva of *Tetramorium* (Fig. 2, *B*) for comparison. It will be seen that though both larvæ possess pairs of long anchor-tipped dorsal hairs, the head of the *Anergates* larva is naked, and its short dorsal and ventral hairs (*b*) are much more densely and compactly branching, while the longer hairs (*a*) are serrate and not branched at their tips like the homologous structures (*d*) of the *Tetramorium* larva. The anchor-tipped hairs (*c*) with sigmoid basal flexure are used in both species for fastening the larvæ to the lower surfaces of stones, the roots of plants and the walls of the galleries and chambers of the nest.

#### IV. *Monomorium minutum* Mayr.

August 27, between nine and ten A. M., while I was collecting in a field near the Jewish cemetery on the island of Lido, near Venice, I happened on a number of colonies of *Monomorium minutum* which were nesting in small and indistinct masonry mounds in the grass. These nests were not unlike those of the form which in the eastern

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\* Myrmecologiska Studier—II. Svenska Myror och deras Lefnadsförhållanden, *Bih. Svensk. Vet.-Akad. Handl.*, XI, 1886, p. 274, pl. VII, figs. 5 and 5a.

and southern United States has been passing under the name of *M. minutum* var. *minimum* Buckley. What attracted my attention to these nests was the great number of extremely small, jet-black workers running up and down the grass-blades around the entrances. On closer examination I found that the ants were celebrating what corresponds to the nuptial flight in other species. Among the workers were numbers of females, running up and down the grass-blades and still issuing from the galleries, but all of these females were wingless. They moved about in great excitement behaving exactly like the winged females of other ants on such occasions, but being unable to fly, they finally crawled down to the ground and wandered away from the nests, often accompanied for a short distance by the excited workers. There were no males to be seen either outside or inside the nests. Throughout the morning I kept finding the wingless females in all parts of the field, running about singly and evidently seeking for places in which to found their formicaries.

Examination of all the females I could capture—several dozens in number—showed that they were truly apterous. Their thoraces were narrow and, though queen-like in the structure of their sclerites, showed not the slightest evidence of ever having borne wings. These females were, in fact, precisely like the females of the tropical *M. floricola* Jerdon and *M. carbonarium* F. Smith subsp. *ebcniuum* Forel described in my paper on the ants of the Bahamas.\* This peculiar condition and the complete absence of males at the time of the abortive but unmistakable marriage-flight (*sit venia verbo*) described above, suggested the following questions: Were the ergatoid and apterous females so abundantly produced in each colony fecundated in the parental nest some weeks previously by their own brothers? Or can it be that males are very rarely or never produced by this species, and that the females lay unfertilized eggs capable of developing into workers or females? Or are there two generations of females, one winged and produced earlier in the summer at a time when males also appear, and a later ergatoid and parthenogenetic generation which perform a necessarily abortive marriage-flight in the latter part of August? It is easy to formulate these and other questions, but they are to be answered only by some resident entomologist who can devote special study to this little insect.

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\* The Ants of the Bahamas, *Bull. Amer. Mus. Nat. Hist.*, XXI, 1905, pp. 87-89, Figs. D and E.

The perplexity into which one is thrown by the observations above recorded is not lessened by an examination of the literature. *M. minutum* was first described by Mayr more than half a century ago,\* and it seems to have been little studied since that time. Mayr saw only worker specimens, which he records as coming from Lombardy and from Lido, the very locality in which I happened to find the species. These specimens were taken by Prof. Strobel in sweeping, possibly in the very field in which I made my observations. Even in his later account† Mayr cites only the worker. In 1891 Forel gave a full description of all three phases, which he cited from various parts of Africa.‡ He gave the length of the female as 4-4.5 mm. and says that its "wings are unknown." Apparently he believed that his female specimens were deãlated. The most recent monographer of the European ants, Emery,§ gives the length of the *M. minutum* female as 3.4-3.7 mm., and states that it is "winged." There is, therefore, a discrepancy between Emery's account and my own, and we must suppose, either that *M. minutum* has two forms of females, or that Emery's statement refers to some other form, for I can hardly doubt that the species I observed is really the one described by Mayr, since the workers not only agree perfectly with his account, but came from the type locality. My specimens are, in fact, topotypes, owing to the very small size of Lido and the restricted area on the island which can be inhabited by these ants.

Not only will it be necessary, therefore, to reëxamine the material of *M. minutum* in our collections, but this should also be done with all the other small black species of *Monomorium* (*ebeninum*, *carbonarium* and *minimum*). I am satisfied that the American form called *M. minutum* var. *minimum* Buckley by Emery|| should be regarded as specifically distinct, as all three of its phases are not only larger (worker nearly 2 mm., female 4.5-5 mm., male 3.5-4.5 mm.) than those of *minutum* (worker 1.4-1.6 mm., female 3.4-3.7 mm., male

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\* Formicina Austriaca, 1855, p. 453.

† Die europãischen Formiciden, 1861, p. 72.

‡ Formicidæ, in Hist. Phys. Nat. Polit. Madagascar, par A. Grandidier, 1891, p. 165.

§ Beitrãge zur Monographie der Formiciden des palãarktischen Faunengebietes, V. Deutsch. Ent. Zeitschr., 1908, pp. 666 and 680.

|| Beitrãge zur Kenntniss der nordamerikanischen Ameisenfauna, Zool. Jahrb. Abth. f. Syst., VIII, 1894, p. 274.

4 mm.), but the females are always winged. The form I described from Catalina Island\* as *M. minutum* subsp. *ergatogyna*, which has ergatoid females like those of *cbeinimum* and *minutum*, may prove to be the typical *minutum* accidentally introduced into Catalina. Its workers are, however, decidedly larger than the Venetian specimens, though they have the same depressed and sloping epinotum.

#### POSTSCRIPT.

Since the foregoing paragraphs were sent to the printer, Professor Emery has published a revision of the genus *Strongylognathus* (Beiträge zur Monographie der Formiciden des paläarktischen Faunengebietes (Hym.), IX. *Deutsch. Ent. Zeitschr.*, 1909, pp. 695-712, 7 figs.). He not only describes several new subspecies and varieties, but changes the status of some of those previously known. The following is a list of the forms as they now stand, including the new subspecies described above:

*Strongylognathus testaceus* Schenck (Central and Southern Europe).

*S. huberi* Forel, including:

Subsp. *huberi huberi* Forel (Canton Vallais, Switzerland);

var. *gallica* Emery (Pyrenees);

var. *forli* Emery (Eastern Algeria);

var. *christophi* Emery (Eastern and Southeastern Russia);

Subsp. *alpinus* Wheeler (Zermatt, Switzerland);

Subsp. *rehbinderi* Forel (Caucasus);

var. *cecconii* Emery (Tremiti Islands in the Adriatic);

Subsp. *ruszkyi* Emery (Ural Mts.).

*S. afer* Emery, including:

Subsp. *afer afer* Emery (Western Algeria);

Subsp. *caciliae* Forel (Spain).

*S. alpinus* resembles *S. huberi* var. *gallica*, to judge from Emery's brief description of the worker: "Kopfseite noch mehr gebogen als im Typus; Postpetiolus im Verhältnis zum Petiolusknoten viel kürzer; Thoraxrücken kaum eingedrückt; Epinotum mit schwacher Spur von Zähnen." I had originally dedicated the subspecies *alpinus*

\* Ants from Catalina Island, California, *Bull. Amer. Mus. Nat. Hist.*, XX, 1904, p. 269.

to Professor Forel, but Emery's recent description of a variety of *huberi* as *foreli* has compelled me to change the name. It is an interesting fact that nearly every form of *S. huberi* has been recorded from a different locality. This seems to indicate that the species is extremely sensitive to differences in external conditions.

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## A CRICKET NEW TO NEW JERSEY.

BY WM. T. DAVIS,

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While sitting on the ground in the pine woods at Lakehurst, N. J., on the third of October, I noticed a small female cricket, which was promptly captured. Shortly after Mr. Chas. E. Sleight called my attention to another on my shoe. This last was a male. I had been hearing an unfamiliar low sounding *chink, chink, chink*, which I presume was made by the species of cricket under consideration. Upon further search we each captured two more specimens, making in all three males and three females. After this we were unable to find any others.

In the Proceedings of the Boston Society of Natural History for October, 1868, Dr. Scudder describes as new the genus *Cycloptilum* founded on a single male cricket from Texas, which he called *squamosum*. The description of the genus *Cycloptilum* and the species *squamosum* as there given answers very well for the Lakehurst specimens, but later Dr. Scudder in his "Guide to the Genera and Classification of the North American Orthoptera Found North of Mexico," 1897, following the tables given by Saussure in 1877, gives an additional character to the genus which would not readily permit of the placing therein of the Lakehurst specimens.

Dr. Scudder says of *Cycloptilum* in 1897, "First joint of hind tarsi neither sulcate nor serrate; pronotum produced posteriorly, concealing the metanotum." The males of the species from Lakehurst have the pronotum as here described, but the first joints of the hind tarsi in both sexes have each two rows of serrations on their upper sides.

Saussure in 1874 in his figure of the posterior leg of *Cycloptilum americanum* (= *C. poeyi* of the plates), shows that there are no